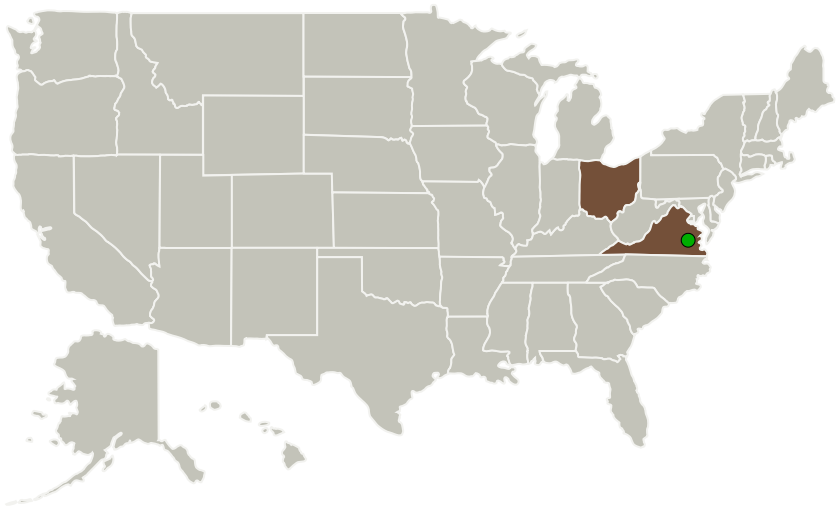
Plasma Sensor for High Bandwidth Mass-Flow Measurements at High Mach Numbers with RF Link, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

The proposal is aimed at the development of a miniature high bandwidth (1 MHz class) plasma sensor for flow measurements at high enthalpies. This device uses a plasma discharge between two encapsulated electrodes as the primary sensing element to measure various flow parameters including mass flow. The advantages of the plasma sensor are that it requires no frequency compensation up to its A.C. carrier frequency, has an amplitude-modulated output that has excellent common-mode rejection with a signal-to-noise ratio that is much better than a hot-wire, is robust with no sensor element to break, can have a small spatial volume, and is insensitive to temperature variations making calibration easier than thermal-based sensors. This sensor has applications for measurements in gas-turbine machinery, shock tubes, shock-boundary layer experiments, high-enthalpy hypersonic flows, and in plasma-laden flows such as on reentry vehicles. The output from the sensor is wirelessly transmitted and can be remotely demodulated and converted into the constituent mean and fluctuating components. The proposed effort is designed to advance and expand the capabilities of the plasma sensor for high Mach number flows.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Spectral Energies, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Dayton, Ohio
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138408)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Spectral Energies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

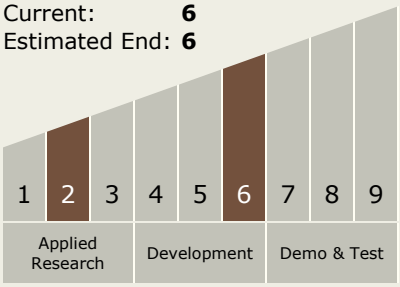
Carlos Torrez

Principal Investigator:

Sivaram Gogineni

Technology Maturity (TRL)

Start: **2**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System